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Farmers' Perception on Cumin Based Intercropping Systems: A Case in Arid Zone of Rajasthan

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ABSTRACT

In aberrant rainfall years, intercropping seems to be good preposition to sustain the production of cumin in rain-fed areas. Besides, in normal season, it increases the farm income and aims at efficient utilization of solar energy, moisture and nutrients. The present study was conducted in Pali district arid zone of Rajasthan. There are ten blocks in Pali district, out of which two blocks were selected by random technique from the identified district. Four villages were selected randomly from each identified block. For selection of respondents a total of one hundred thirty five farmers were selected from eight villages by proportionate random sampling. The respondents were further divided into three categories small, medium and large based on size of land holding. The most important intercropping system for the farmers of Pali district was cumin + gram and cumin + fenugreek. The farmers of the region were not aware of the recommended plant protection and production practices of cumin based intercropping systems. There is acute lack of transfer of technology efforts. Hence, the extension agency should take the lead role in transferring the research recommendations to the farmers of this area. Timely, availability of inputs like seed, fertilizer and plant protection chemicals are important for getting higher yield. Hence these may be taken by the policy makers/ extension agency and providing suitable price to cumin, gram and fenugreek will go a long way in sustaining these intercropping systems in the region. Also, certain researchable issues emerged from the study viz., development of suitable seed drill for ICS, determination of highly profitable row ratios and development of soil moisture conservation techniques for intercropping system. These issues may be given priority in research for developing the required technology for cumin based intercropping systems.

Seed spices are now becoming more popular due to their profitability, short duration and greater potential to grow in low rainfall areas. They are cultivated mainly in the arid and semi-arid region of North India. The major seed spices crops are cultivated extensively in the state of Rajasthan, Gujarat and to a smaller extent in Madhya Pradesh, Punjab, Haryana, and Maharashtra. Rajasthan and Gujarat contribute more than 82 per cent of the total seed spices production in the country. This belt can, therefore, be called as "**seed spices bowl**" of the country. There are great prospects for seed spices development in this region of the country.

Cumin is one of the important ingredients of human diet throughout the world. It is used in large number of processed foods as well as in daily food recepies due to its agreeable flavour and aroma and also used in seasoning bakery products such as bread and cake. Besides, it has medicinal importance and is used as a stimulant carminative, stoma chic, astringent and useful against diarrhea and dyspepsia. Cumin seeds are also used in number of veterinary medicines. On distillation, the seed yields are about 3 per cent essential oil, which has a characteristic odour and a little bitter taste. The oil of cumin is used in perfumery, for flavoring liquors and cordials. The aromatic odour of cumin seed is due to the presence of cuminaldehyde or cuminal which ranges from 2.5 to 4.0 per cent. Cumin seed contains 11.9 per cent moisture, 18.7 per cent protein, 15.o per cent other extract, 36 per cent carbohydrate, 12 per cent minor matter, 1.08 per cent calcium, 0.49 per cent phosphorus, 3.10 mg per 100 gram. The cumin seed after distillation yield 2.4 per

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cent volatile oil. India is largest producer of cumin seed and it is cultivated on 6.43 lacs hectares land with a production of 12.47 thousand tones in the year 2008-09. The cumin seed were exported to the tune of 13750 tonnes valued worth Rs. 12280 lacs during the year 2009-10 (Anonymous, 2009). The main markets for cumin are Japan, USA, UK, Canada, Singapore, and UAE.

Cumin is grown mostly under rain-fed conditions during *rabi* season. The wider spacing practiced for cultivation of cumin made it possible to grow an intercrop with many other annual oilseeds, legumes and cereals crops. There is now ample evidence that net returns are higher with intercropping over sole cropping (Ashok *et al*. 1987) besides compensating the risk of crop failure during aberrant rain fall years. One of the main reasons for such advantage is that the component crops are able to use resources differently (Shinde and Umaarani, 1988), so that when grown together they supplement each other and make better use of resources than growing separately. Besides increasing productivity of the component crops, intercropping also reduces weed competition infestation of insect pests and diseases in the system and improves soil productivity. In aberrant rainfall years, intercropping seems to be a good preposition to sustain the production of cumin in rain-fed areas. Besides, in normal season, it increases the farm income and aims at efficient utilization of solar energy, moisture and nutrients. Two decades of research on cumin based intercropping system at Central Arid Zone Research Institute (CAZRI) and other research centers through out India have generated lot of information on crop combinations, row ratios, fertilizer schedule and economics. But it appears that the information has not percolated to farmers. Hence, the present study was under taken to ascertain the status of intercropping systems in Pali district of Rajasthan.

METHODOLOGY

The present study was conducted in Pali district of Rajasthan. There are ten blocks in Pali district, out of which two blocks namely, Sumerpur and Raipur were selected by random technique from the identified district. Four villages were selected randomly from each identified block were selected by simple randomly. Thus, in all eight villages were selected for the study. For selection of respondents a total of one hundred thirty five farmers were selected from eight villages by proportionate random sampling. The respondents were further divided into three categories small (below1 ha), medium (1-2 ha) and large (above 2 ha) based on size of land holding. A semi structured interview schedule was used to collect the data from the respondents.

RESULTS AND DISCUSSION

Adoption of cumin based intercropping systems (ICS):

The data given in Table 1 indicated that the most important ICS to all categories of farmers was cumin + gram (40.0 per cent) followed by cumin + fenugreek (35.6 per cent), cumin + fennel (22.2 per cent), cumin + mustard (15.9 per cent), cumin + wheat (07.4 per cent), cumin + barley (02.2 per cent). The cumin + gram and cumin + fenugreek system were adopted by more than 83.00 per cent of the sampled farmers. These results were in consonance with the results of Ghosh and Sojitra (1997). These two systems were more popular with small farmers compared with medium and large farmers where as, cumin + mustard was more popular with large farmers because the system needed higher investment compared to other ICSs.

Table 1 Adoption of different ICS by farmers in Pali district (N=135)

S.No.	ICS	Small N=41		Medium N=44		Large N=50		Total N=135	
		f	%	f	%	f	%	f	%
1	Cumin+ gram	18	43.9	18	40.9	18	36.0	54	40.0
2	Cumin+ fenugreek	16	39.0	17	38.6	15	30.0	48	35.6
3	Cumin + fennel	04	09.8	10	22.7	16	32.0	30	22.2
4	Cumin + mustard	03	07.3	02	04.5	03	06.0	08	15.9
5	Cumin + wheat	02	04.9	04	09.1	06	12.0	10	07.4
6	Cumin + barley	02	04.9	01	02.2	00	00.0	03	02.2

Advantages of intercropping system based on economics and sustainability:

All the sampled farmers irrespective of farm size perceived risk management, increased Land/Water/ fertilizer use efficiency (LUE/WUE/FUE) and complimentary effect of each crop were the important advantages of intercropping (Table 2).

Table 2 Farmers' perception of advantages of cumin based ICS (N=135)

S. No.	Advantage	Small N=41		Medium N=44		Large N=50		Total N=135	
		f	%	f	%	f	%	f	%
I	**Based on economics**								
1	Production of higher biomass	17	41.5	17	38.6	13	26.0	47	34.8
2	Reduced use of inputs (fertilizer, verm-compost)	23	56.1	20	45.5	19	38.0	62	45.9
3	Maximizing productivity	30	73.2	22	50.0	31	62.0	83	61.5
4	Remunerative prices	25	60.9	23	52.3	36	72.0	84	62.2
5	Risk management	41	100	44	100	50	100	135	100
6	Revival of crops after relief of drought	41	100	43	97.7	50	100	134	99.3
7	Capitalizing later rains by long duration crops	38	92.7	36	81.8	34	68.0	108	80.0
II	**Based on sustainability**								
8	Increase LUE/WUE/FUE	41	100	44	100	50	100	135	100
9	Soil improvement	32	78.0	37	84.1	33	66.0	102	75.6
10	Legume effect	35	85.3	24	54.5	26	52.0	85	62.9
11	Complimentary effect of each crop	41	100	44	100	50	100	135	100

N= Number of respondents, F= Frequency, LUE=Land Use Efficiency, WUE=Water Use Efficiency, FUE= Fertilizer Use Efficiency

This might be due to the fact that during poor irrigation facilities/ inadequate rainfall the component crops gram and fenugreek sustained the farmers. Apart from this the stubbles could be utilized as vermin-compost, making litter at animal shed and used in seed storage in rural areas (Ghewande et al., 2004). The other advantages of cumin based ICSs perceived by farmers were revival of crops after relief of drought (99.3 per cent), capitalizing on later rains by long duration crop (80.0 per cent), improvement of soil physical properties (75.6 per cent), legume effect and remunerative prices (62.9 per cent, each), reduced use of inputs like vermi-compost and fertilizes (45.9 per cent) and production of higher biomass (34.8 per cent). The findings confirm with the findings of Baby and Singh (2007).

Factors influencing yields in cumin based ICS:

The most important factor influencing yield in cumin based intercropping system for all the categories of farmers was timely, sowing of crop (100 per cent) followed by rainfall distribution (91.10 per cent), plant protection measures (84.40 per cent), preceding crop grown on the same field (74.80 per cent), crop combinations (21.50 per cent), crop geometry and fertilizer application for component crops (11.90 per cent each) Table 3. The findings confirm with the findings of Kumar et al. (2007).

Table 3 Factors influencing yield in cumin based ICS **(N=135)**

S. No.	Factor	Small N=41		Medium N=44		Large N=50		Total N=135	
		f	%	f	%	f	%	f	%
1	Crop combinations	08	19.5	12	27.3	09	18.0	29	21.50
2	Crop geometry	00	00.0	10	22.7	07	14.0	17	12.60
3	Timely sowing of crop	41	100	44	100	50	100	135	100
4	Rainfall distribution	38	92.7	39	88.6	46	92.0	123	91.10
5	Application of fertilizers for component crops	09	21.9	07	15.9	00	00.0	16	11.90
6	Plant protection measures	35	85.4	32	72.7	47	94.0	114	84.40
7	Preceding crop	37	90.2	30	68.2	34	68.0	101	74.80

Constraints in adoption of ICS:

A perusal of data in Table 4 reveal that the important constraints perceived by farmers in adoption of ICS was low rainfall (97.0 per cent), non-availability of inputs (100 per cent), inadequate transfer of technological interventions (95.6 per cent), lack of knowledge on recommended plant protection measures (86.07 per cent), lack of irrigation facilities (71.9 per cent), soil unsuitable for intercropping (52.6 per cent), lack of suitable seed drill for cumin sowing (35.6 per cent), imbalanced row ratios (32.6 per cent), lack of awareness on plant nutrition for sowing for component crops (12.6 per cent) and low market price (06.7 per cent).

Table 4 Constraints in adoption of cumin based ICS **(N=135)**

S. No.	Constraints	Small N=41		Medium N=44		Large N=50		Total N=135	
		f	%	f	%	f	%	f	%
1	Lack of suitable seed drill	13	31.7	24	54.5	11	22.0	48	35.6
2	Low market price	01	02.4	03	06.8	05	10.0	09	06.7
3	Lack of irrigation facilities	33	80.5	35	79.5	29	58.0	97	71.9
4	Imbalance row ratio	27	65.9	00	00.0	17	34.0	44	32.6
5	Soil unsuitable to ICS	06	14.6	31	70.5	34	68.0	71	52.6
6	Inadequate transfer of technology	37	90.2	42	95.5	50	100	129	95.6
7	Non-availability of inputs	41	100	43	97.7	50	100	135	100
8	Low rainfall	40	97.6	41	93.1	50	100	131	97.0
9	Lack of awareness on plant nutrition for component crop	09	21.9	08	18.1	00	00	17	12.6
10	Lack of knowledge on plant protection for component crops	37	90.2	33	75.0	47	94.0	117	86.7

The most important constraint for small farmers was non-availability of inputs followed by inadequate rainfall and lack of irrigation facilities where as for medium and large farmers, they were inadequate transfer of technological interventions and inadequate rainfall. The findings confirm with the findings of Singh et al. (2007).

CONCLUSION

The most important intercropping system for the farmers of Pali district was cumin + gram and cumin + fenugreek. The farmers of the region were not aware of the recommended plant protection and production practices of cumin based intercropping systems. There is acute lack of transfer of technology efforts. Hence, the extension agency should take the lead role in transferring the research recommendations to the farmers of this area. Timely availability of inputs like seed, fertilizer and plant protection chemicals are important for getting higher yield. Hence these may be taken by the policy makers/ extension agency and providing suitable price to cumin, gram and fenugreek will go a long way in sustaining these intercropping systems in the region. Also, certain researchable issues emerged from the study viz., development of suitable seed drill for ICS, determination of highly profitable row ratios and development of soil moisture conservation techniques for intercropping system. These issues may be given priority in research for developing the required technology for cumin based intercropping systems.

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